THE

Malayan Agricultural Journal.

Vol. XI. February, 1923. No. 2.

EDITORIAL.

RUBBER CULTURE IN THE PHILIPPINES.

Since the introduction of restriction, the newspapers have contained statements emanating from the U.S.A. to the effect that rubber growing would be taken up on a large scale in the Philippines presumably to make America independent of supplies from Malaya and Ceylon.

Attention has been given in the Philippine Islands to rubber for some years past, apparently without conspicuous success, and the following extracts from an article in "The Philippine Agriculturalist and Forester" of September 1916—Vol. V, No. 5, page 159 on "Local Growth of Rubber and Gutta percha Plants," by R. O. Sarmiento do not suggest that the American threat will readily materialise.

"A number of plantations have been started in the Philippines, and on other plantations, rubber has been planted incidentally in association with other crops regarded as staples. As a rubber plantation, the only successful one up to this time is that established and managed by Dr. Strong, near Isabela de Basilan. At this place, Mexican and Ceara rubber have been tried and discarded; Para rubber has been successful and is now paying the cost of the plantation, including a rather rapid extension of area. On the plantation of Mr. Orville Wood on the Gulf of Davao, Mexican and Para rubbers were planted, and Mexican rubber proved the more successful under the local economic conditions."....

"At the College of Agriculture, as complete a collection of rubber producing plants as possible was assembled several years ago. Experience with these various plants has brought College authority to the conclusion that conditions of temperature and rainfall at low altitudes in all parts of the Islands are suitable for some rubber-producing plant or other; but that rubber-producing plants as a whole are so susceptible to damage by storms that the establishment of rubber plantations is not a safe business undertaking except in the extreme southern part of the Archipelago. In the far south, in the

" belt of tropical calms," where typhoons are practically unknown, Para rubber can be expected to succeed, where wet and dry seasons are not too distinct, and the Mexican rubber to succeed where the dry season is severe. The more recently discovered species of Manihot, and some of the rubber-producing vines, have still to be given careful test; the vines, but not the Manihot, may be cultivated where typhoons occur, if they prove able to produce rubber at a satisfactory profit." (*January 2nd, 1923.*)

THE PRACTICE OF BUD-GRAFTING.

Results obtained in Java by tapping 4-5 year old bud-grafts (Malayan Agricultural Journal Vol. X. No. 7, page 174) have shown that it is no longer possible to assume that bud-grafts from high yielders will all be high yielders. While all the grafts from one mother-tree resemble one another in yield more closely than a random assortment of seed plants this yield may be high, medium or low, independently of any ascertainable character of their mother-trees.

It is obvious that the best results can only be obtained if "good" mother-trees are used; at present, there is no method of ascertaining whether any mother-tree is " good " other than the direct and lengthy one of growing and tapping a number of offspring from it. Bark characters, *e.g.* numbers of latex rings have not so far been proved to be reliable either in the mother-trees as measures of " goodness " or in the young grafts as a guide to probable yield.

It was pointed out in the article cited above that bud-grafting has not yet passed the experimental stage and been established as a commercial success. Should however any Estate or group of Estates contemplate planting areas of any size with bud-grafts in the future, it is strongly recommended that experimental plots of about 60 grafts—say 1 acre—per mother-tree should be laid down, and the trees tapped from their 4th year.

Needless to say, the marking and identification of parent trees and grafts must be carried out as carefully as in any other scientific experiment.

As far as possible the Department of Agriculture will be prepared to help with advice those who contemplate experimental work as outlined above.

It must clearly be understood that the laying down of such plots is not advocated as a guarantee of success; it may however ensure the saving of considerable sums. (*January 2nd, 1923.*)

PRELIMINARY REPORT ON BROWN BAST EXPERIMENTS IN MALAYA.

By A. Sharples and L. Lambourne.

A previous review (7) by the senior author treats of the early work carried out in Malaya to find a causal agent for Brown Bast. Some attention is devoted to the published work of various authors, more especially to that of Rands (5) whose work in Java was contemporary with and paralleled that carried out in Malaya. The recent work of Sanderson and Sutcliffe (6), Bryce (2), Bateson (1) and Farmer and Horne (3) was briefly considered; the latest work to appear is a detailed treatise by Keuchenius (4) working in Sumatra.

Experimental work on Brown Bast was taken up by the writers in 1919. At this time the physiological nature of the disease was recognised by most authorities working on the subject and the evidence in favour was overwhelming. More light upon the problem could be obtained only by working upon the individual factors influencing the incidence and development of the disease. This was obviously a matter for field experiments.

The way was opened up by Rands' (loc. cit) heavy tapping experiments which showed that a high percentage of trees developed Brown Bast when tapped six times a day on three superimposed quarter cuts. Belgrave adapted the heavy tapping to Malayan needs by substituting a full spiral cut, once daily, as sufficient to produce an appreciable percentage of Brown Bast in a few months time. The experiments comparing Daily, Alternate Daily and Every Third Daily on ¼ Spiral, ½ Spiral and Full Spiral cuts published in the review mentioned above were in hand when the senior writer took over.

In this first series of experiments the number of Brown Bast trees was verified by Mr. F. W. South, Chief Agricultural Inspector, F.M.S. and S.S. while the yield figures were later worked out and analysed by the writers. This analysis presented many interesting features and further field experiments were planned to test as many points as could be conveniently dealt with.

This article will deal briefly with the more important points observed, full details being reserved for a final publication. The first series of experiments indicated:—

(1) That comparative Brown Bast experiments could not be conveniently dealt with using the tapping systems commonly in vogue. A single daily cut on a quarter or half of the tree does not give an amount of Brown Bast sufficiently large to lead to any definite conclusions. Therefore drastic tapping systems have to be resorted to.

(2) Comparative results on Full Spiral tapping with different intervals, *i.e.* Daily, Alternate Daily and Every Third Day, showed a large percentage of Brown Bast trees in the Daily plots, a greatly reduced number in the Alternate Daily and a still further reduction in the Every Third Day plot. The Alternate Daily plots had about 400 trees each, the rest approximately 550 trees. The Brown Bast figures after seven months were

Daily.	Alt. Daily.	Every Third Day.
102	42	24
20%	10%	5%

The differences are sufficiently large to warrant the statement that "On the same length of cut, Alternate Daily tapping is superior to Daily tapping from the point of view of Brown Bast, while a further improvement can be effected by extending the intervals between tappings."

(3) The yield figures are suggestive. For example total yields from the Daily ½ Spiral plot = 1019.94 lbs., from the Alternate Daily ½ Spiral = 523.14 lbs., and Every Third Day ½ Spiral = 383.67 lbs. A rough comparison can be made by taking the Daily ½ Spiral yield as standard and then multiplying the yield figures of the other two plots by two and three respectively. This gives

Daily ½ Spiral.	Alt. Daily ½ Spiral.	Every Third Day ½ Spiral.
1019.94	523.14 × 2 = 1046.28	383.67 × 3 = 1151.01

These figures, taken over seven months, fall within expectations and the yield figures of the Alternate Daily ¼ cut and Every Third Day ¼ cut are of a similar nature with reference to the Daily ¼ cut. With the Full Spiral system the final comparative figures show large differences as follows :—

Daily F.S.	Alt. Daily F.S.	Every Third Day F.S.
2802.25	2802.25 × 2 = 4245.56	2802.25 × 3 = 5498.76

These figures if supported by further evidence are very significant. They indicate the lack of exact knowledge regarding the response made by *Hevea brasiliensis* when tapping systems outside the ordinary routine are in operation. This point is of considerable importance in relation to the Brown Bast problem, for many investigators are in accord in regarding this affection as a wound response due to over-tapping. If high-yielding is a factor of importance, the results also indicate the possibility of yields being limited by the development of a high percentage of Brown Bast. In the writers opinion it appears probable that according to type of soil and general growth conditions in any area the yield is sharply limited. Below this limit the amount of Brown Bast developed is of little importance from a practical standpoint but above the limit there is a tremendous percentage increase disproportionate with the increased yield. This point must be taken into consideration in the general question of obtaining high-yielding strains of *Hevea Brasiliensis* by bud-grafting and selection. The Brown Bast problem, in fact, apart from its scientific interest, is of little general importance during a period when

restricted yields obtained by increasing the length of time between tappings *i.e.* Daily to Alternate Daily, are the rule. The Brown Bast problem becomes of primary importance when considered as a limiting factor in the question of high yields.

The above first series of experiments indicated other points of interest. A sudden jump in number of Brown Bast cases during certain months had to be confirmed or otherwise; in view of this peculiarity it appears that to obtain a guiding line as to the behaviour of different plots with reference to Brown Bast development at least three months previous heavy tapping is necessary. These points were confirmed by many later experiments so that subsequently the experimental plots were subjected to three months preliminary tapping on a Full Spiral, once daily.

In the second series of experiments 410 trees were taken and after the three months preliminary tapping were divided into blocks of approximately 50 trees. The small plots were then put under systems with varying lengths of cut from ½ Spiral to Full Spiral. These trees were 12 years old; The trees were opened up for tapping during the fourth year at 24 inches from the ground on a single V and in order to obtain time for bark renewal the second period was carried from the 36 inches to the 24 inches mark when the opposite V panel had been tapped. To get tappable bark of the same age our experimental tapping had to be carried out in virgin bark over the 36 inches mark. The more important results are mentioned below.

(1) The sudden rise followed by a long rest period indicated previously was confirmed by these and all later experiments. The 1921 experiments supported the experience gained in 1919 in that the months, March to August were quiescent Brown Bast months. This suggested the possibility of wintering and low rainfall both influencing the results. However, 1922 showed May, June and July as heavy Brown Bast months and these are usual months of low rainfall which are fairly constant, year by year, in this district. As far as observations have been carried there is some difficulty in associating any external factors with the results obtained.

(2) Another notable feature in this series of experiments was the stoppage of the extension of Brown Bast at definite places marked by the different ages of tapped bark. As indicated above, the vertical sequence from above downwards was in virgin bark—this passed into renewed bark two years old at the 36 inches level and this panel passed into 4—6 years old renewed bark at the 24 inches mark. To record briefly—out of 410 trees, 133 developed Brown Bast. Of these, no extension took place after tapping was stopped in 40 trees. In another 20 trees the Brown Bast stopped at the 36 inches mark, (the junction between the virgin and the youngest renewed bark); in 47 trees the Brown Bast extended to the 24 inches mark (the junction between the old and young renewed bark), and in 19 trees the affection extended to the base of the tree.

These results are of both practical and theoretical importance and have been confirmed by subsequent experiment. Details must be left to a final paper.

(3) Special importance is assigned to a plot of 44 trees, tapped on a $\frac{7}{8}$ Spiral, the heaviest system apart from the Full Spiral. While the neighboring seven plots were responding to experiment in a normal manner this plot was obviously abnormal. From November, 1920 to August, 1921 only two Brown Bast trees were reported. In September, 1921 a sudden increase of six Brown Bast trees was reported.

The abnormally long quiescent period might have considerable significance and tapping on this plot was continued. A control plot was obtained by continuing the tapping on one of the normal plots which had been tapped on a $\frac{3}{4}$ Spiral.

From September, 1921 to December, 1922 the abnormal plot developed Brown Bast in a normal manner. The change was correlated with a sudden increase in average tree yield. This correlation is supported by figures taken over a considerable period of time, the curves for average tree yield and percentage increase in Brown Bast cases conform closely to one another. The conclusion must be drawn that Brown Bast is closely associated with the question of high yields and it is almost certain that this affection must act as a limiting factor in the question of high-yielding trees.

The appearance of a number of Brown Bast cases is so sudden that it may be classed under the phenomena dependent on "trigger action," *i.e.* a sudden release followed by immediate effects. In the space of 24 hours the typical Brown Bast symptoms as known from field observations, will become obvious on numerous trees which had shown none the previous day. A most important question to be answered is "What changes take place in the physiological processes leading up to this sudden release?" It appears most probable that the Brown Bast affection is to be considered as an exhaustion process. Accepting this point of view, it has been possible to connect up many isolated observations; further, laboratory observations previously contradictory, fall into line when this basis is utilised.

Tapping experiments have been carried out to test other points of interest, such as specific immunity, permanancy of yield in good and bad yielders and their behaviour towards Brown Bast development, etc. Details of these must be left for a final article.

Another line has been taken in hand recently owing to Farmer and Horne's researches on specimens sent from the Middle East to England for examination. These investigators describe a breaking-down of the sieve-tubes and suggest this as an incipient stage in Brown Bast. This type of abnormal behaviour is included under the term of Phloem Necrosis, typified in other cases by lignification of the cellulose walls of the sieve-tubes. Lignification of the sieve-tube walls is a common feature in the tapped bark of *Hevea brasiliensis*, moreover in trees which could not be suspected of Brown Bast. The findings of Farmer and Horne have been given some prominence in an article in Nature by Dr. S. E. Chandler but the senior writer, having had this particular phase of sieve-tube changes under observation for the last three years would accept their suggestions with

considerable reserve. Plots of trees, with and without lignified sieve-tubes have now been selected and similar tapping experiments to those described will be carried out to determine which develop Brown Bast most quickly. The results, up-to-date, show that trees originally non-lignified become lignified after being tapped for some time.

The line taken throughout this investigation has been with reference to the disease factor influencing future policy on Malayan plantations. Big claims have recently been made, with reference to increased yields per acre, for trees developed by bud-grafting from known high yielding trees. A forward policy is certainly desirable but the attendant risks should be fully realised.

Apart from the considerable body of evidence obtained during the present investigation which, at least, cannot be said to favour the policy urged by the supporters of bud-grafting, the general position at the present time is seldom clearly presented. If excessive yielding results in exhaustion, then high-yielders will tend to show this effect sooner than average yielders. Further, this feature must be closely connected with some difference in physiological activity and the higher the yields the greater this difference becomes. Plant morphology is now recognised as an expression of physiological activity and small changes in the latter may produce far-reaching effects in plant structure. In the case of *Hevea brasiliensis* in Malayan plantations, an insufficient development of leaf cuticle would give many organisms a chance of effecting an entry and invading the leaf tissues. Positive evidence to this effect has already been obtained in Malaya. On one estate where bud-grafts were successfully established on three year old stocks, the leaves of the graft were badly attacked by several species of fungi usually saprophytic. This resulted owing to the leaves being too abundantly supplied with nutrient material from a root system which previously had supplied many thousands times the number of leaves. The leaves of these bud-grafted plants were pale-colored, thin and obviously deficient in cuticle when compared with the usual type of rubber leaf.

Should the optimistic yields from bud-grafts materialise, the trees certainly will have physiological activities of a different order to those obtaining in the present day plantations. The direction will be towards accelerated vital activities, *i.e.* transpiration, respiration and absorbtion. Strong cuticular development is not usually associated with active transpiration, and it is possible that high-yielding bud-grafts may tend to develop less resistant cuticle.

At the present time there is a very dangerous organism epiphytic on rubber leaves which with little encouragement, would be able to cause much damage if it could penetrate into the leaf tissues, and it is doubtful if much could be done to check its activities. This parasitic alga has been long known as the cause of serious losses on Tea and Cloves; recently the senior writer visited Sarawak to investigate a disease of Pepper Vines which had been responsible for a reduction of exports from $2,733,301 in 1903 to $712,122 in 1920. The cause of this disease was the same parasitic alga, *Cephaleuros mycoidea* (Karsten). Again, rubber planting in British and Dutch

Guiana has been rendered unprofitable by the attacks of a leaf fungus and it is more than possible that this organism may have a close relation in the Middle East capable of doing damage under favourable conditions.

The point to be clearly recognised is that the margin of safety is small and that exceedingly large risks are attached. It is for these reasons that we claim that the published bud-grafting results are insufficient upon which to base any definite policy, that neglect of vital factors in the published results calls for strong comment from a scientific point of view and that no great care has ever been taken to point out the attendant risks. The admission that in Malaya there has been no opportunity to carry out experimental bud-grafting for ourselves, does not prevent us calling attention to the shortcomings in the records presented by the published results relating to bud-grafting.

(1) Bateson, E. ... The Tapping of the Para Rubber Tree Bull. No. 23, Department of Agriculture, F.M.S.

(2) Bryce, G. ... Bull. No. 28, Department of Agriculture, Ceylon, October 1916.

(3) Farmer, J. B. and Horne, A. S. Phloem-Necrosis, Brown Bast disease in Hevea brasiliensis. Anns of Botany, Vol. XXXV, No. CXXXIX, July 1921.

(4) Keuchenius, P. E. ... Die Rindenbraune der Hevea Brasiliensis. Cent. for Bacteriologie, Parasitenkunde und Infektionskrankheiten Zweite Abteilung, Bd. 55/1921 Heft 1/4.

(5) Rands, R. P. ... De Bruine Binnenbastziekte Van Hevea brasiliensis; Archief Von Rubber Cultuur in Ned. Indies 1919.

(6) Sanderson, A. P. and Sutcliffe, H. Brown Bast. Rubber Growers Association, 38, Eastcheap, London, E.C. 3.

(7) Sharples, A. ... A consideration of recent work on the Brown Bast problem, Malayan Agricultural Journal, June 1922, Vol. X, No. 6.

Received for publication 28th February, 1923.

FINAL REPORT ON TREATMENT OF MOULDY ROT DISEASE WITH AGRISOL.

By A. Sharples.

TWO previous reports dealing with the above have been published in the Agricultural Bulletin F.M.S. The first (Vol. IX, 1921, No. 3) dealt at length with the purely experimental side, the second (Vol. IX, 1921, No. 4) with details of comparative costs over a 5 months period under estate conditions. The results and figures as presented were decidedly encouraging, and if maintained over a lengthy period, indicated efficient control at a remarkably low cost.

This treatment on the estate in question has now been carried on over a period of eighteen months and has proved satisfactory though the Manager raises an objection that the treatment does not eradicate the disease. This point might now be dealt with in order to clear up misconceptions.

The writer's opinion is that *complete eradication is impossible.* The utmost that can be attempted is control *i.e.*, preventing spread and increase in number of diseased trees on individual estates. In the life history of the fungus causing Mouldy Rot, there is a stage when resting spores, *i.e.*, dark colored, thick walled macrospores, are produced abundantly. These spores can withstand adverse conditions, lying dormant during lengthy drought periods and are capable of germinating when wet weather arrives. The production of these resting spores marks the greatest difference, from a practical point of view, between the *Phytopthora* sp. causing "Black Stripe" disease on the tapping surface and *Sphaeronema fimbriatum* the fungus causing Mouldy Rot. A spell of dry weather will cause the complete disappearance of the "Black Stripe" disease because the fungus does not produce spores resistant to dessication. This point is of some importance in the question of Mouldy Rot control for if properly appreciated there is little danger of a careless attitude with the resulting neglect of proper precautions. There is little doubt that an estate, once attacked by Mouldy Rot, will have a recurrence of the disease and the damage done will be inversely proportional to the care taken to prevent a new outbreak spreading.

The cost of controlling the disease with Agrisol over a period of 18 months, on an European estate, worked out at $10\frac{1}{2}$ cents per acre per month. (For particulars of working see the two articles mentioned above). The Manager reports that the treatment insures the bark against injury There is always a number of Mouldy Rot cases to be treated at any one time, but this number does not increase from month to month, and as the bark is kept in good condition, the only factor to be taken into account is that of cost. This figure is remarkably low.

This preventive work on Mouldy Rot gives good reason for stating that this disease can be effectively controlled, and need not be

considered as a vital factor in the economy of any European estate. The position, with regard to native holdings, is somewhat different owing to the difficulty of making native owners realise what care is necessary, and more especially the necessity for a careful watch to be kept for a recurrence of the disease after apparently successful treatment. Difficulties of distribution, errors owing to careless painting, etc., etc., also enter into the problem. However, from that point of view of the individual estate, surrounded by affected holdings, the disease can be effectively controlled as in the case on the estate where the experiments were carried out. Naturally more care is required under such conditions, and costs increased to some extent, but in all disease control in tropical countries, the presence of large numbers of native holdings increased the difficulties. However, work in the direction of educating native owners is being steadily carried on by the Inspection staff of the Department and this, no doubt, will result in much improvement.

Received for publication 29th January, 1923.

NOTE ON MINYAK NYATOH (OIL FROM PALAQUIUM SPECIES).

By C. D. V. Georgi.

AMONG the samples of Oils and Fats exhibited in the Agri-Horticultural Section of the Malaya-Borneo Exhibition was a sample of Minyak Nyatoh prepared by Syed Abdul Rahman, Junior Agricultural Assistant, Pekan.

As this fat had been prepared carefully and was obviously free from impurities it was decided to investigate the sample and ascertain its analytical constants.

Minyak Nyatoh is the local name of fat which is extracted from seeds of one of the species of the Palaquium genus (Natural Order Sapotaceae) all of which yield gutta-percha.

According to de Jong and Tromp de Haas (Chem. Rev. 1904.285) this particular fat is obtained from *Palaquium Oblongifolium* Burck; and the figures which are published by those investigators are in relatively close agreement with those obtained for the present sample as the following table shows:

Fat.	Present sample.	de Jong and Tromp de Haas.
Melting Point (Capillary Tube) ...	42°C	40°C
Density 99°C (Water at 15.5°C = 1) ...	.8571	...
Refractive Index (40°C) ...	1.4570	...
Saponification Value ...	190.6	201.5
Iodine Value (Wijs method) ...	46.6	34.3
Acidity (Oleic Acid per cent) ...	1.1	2.1
Unsaponifiable per cent ...	0.1	
Fatty Acids.		
Solidifying Point (Titer Value) ...	55.5°C	...
Iodine Value ...	40.0	...

Minyak Nyatoh is a hard white fat with a pleasant smell and if available in sufficient quantity would certainly compete with Borneo Tallow, Illipe Fat and other similar fats. It could be used for edible purposes, as well as for soaps and other products for which those fats are employed.

Received for publication, 1st September, 1922.

NOTES ON KAPAYANG OIL.

By C. D. V. Georgi.

In a previous number of the Agricultural Bulletin, Vol. II, 1913-1914, page 67 an account was given of the results of the examination of Kapayang seeds received from the Conservator of Forests.

During the past year two further samples of these seeds have been received and in view of the fact that, although the seeds are both known locally as Kapayang, they are derived from different plants it has been considered advisable to publish the results.

Results of Analysis.

The details of the examination of the seeds and of the oil are shown in the appended table, those for the previous sample being added for purposes of comparison.

Conclusions.

From these results it will be seen that the sample of Kapayang designated 'A' is doubtless derived from the same species as that previously examined, *Hodgsonia heteroclita*. As regards 'B', it is not considered that this can be the *Pangium edule* to which reference is made in Malayan Forest Records "Minor Forest Products of the Malay Peninsula," page 170, as the figure for the percentage of oil in the seed, 7.0 per cent., is not in agreement with that quoted, namely 50 per cent.

Further work is necessary therefore before deciding the name of the plant from which this second variety is derived.

Possibilities of Kapayang Oil.

Although the kernels of one of the varieties of Kapayang contain a large percentage of oil, Kapayang seeds have at present no economic value, the cultivation of the plants not as yet having been taken up commercially, they are purely a forest product.

There is one point which may be of interest, and to which attention would have to be given if the plants were cultivated, and that is the large number of seeds in both samples in which the kernel was undeveloped, which is probably due to non-fertilisation of the flower.

Until therefore the plant has been cultivated under field conditions no information can be given with regard to its commercial possibilities.

Received for publication 1st November, 1922.

Table Showing Results of Analysis of Kapayang Seeds.

Particulars	Previous sample.	Present samples.	
		A	B
Description of seed.	Hard flat outer shell, dull drab colour, average length 2½ inches, width 1 ⅞ inches. Containing soft oily kernel, with thin pericarp of dry mealy nature.	Hard flat outer shell ovoid in shape, buff colour, average length 3 inches, width 1¾ inches, thickness ⅛ inch Containing soft oily kernel with thin pericarp of corky tissue.	Hard flat outer shell, ovoid in shape, buff colour, average length 1⅞ inches, width 1¼ inches. Containing a firm moist kernel enclosed in a thin pericarp of corky tissue.
Average weight of seed.	36.0 grams.	38.0 grams.	...
Proportion of shell	55.3 per cent.	44.5 per cent.	47.2 per cent.
Proportion of kernel.	44.7 per cent.	55.5 per cent.	52.8 „
Analysis of kernel.	Kernels contain 59.4 per cent of oil, corresponding to 26.2 per cent on whole seed. (Petroleum Ether extract.)	PER CENT. Moisture 12.3 Oil (Pet. Ether Extract) 57.4 Residue (by difference 30.3 Oil (On dry kernel) 65.4 Oil (On whole seed) 31.9	Kernels darkened on exposure to air and became mouldy so were partially dried off before analysis. PER CENT. Moisture 10.6 Oil (Chloroform Extract) 21.9 Residue (by difference) 67.5 Oil On dry kernel) 24.5 Oil (On whole seed) estimated 7.0
Description of oil.	Light yellow, melting about 25° C.	Light yellow appears to solidify about 25° C. but on standing for some time oil separates into two layers, the upper a light yellowish oil, the lower a white solid.	Very thick dark brown oil.
CONSTANTS OF OIL.			
Density	0.9164 (15° C.)	0.922 (20° C.)	...
Refractive Index.	1.464	1.4694 (20° C.)	...
Saponification Value.	198.9	203.9	199.5
Iodine value.	65.4	63.6	107.3
Acidity (as Oleic acid per cent.	..	2.8	..
FATTY ACIDS			
Means molecular weight.	..	272.7	...
Solidifying point (Titer value.)	..	40.8° C.	...
Iodine value.	..	61.9	...

BRAZIL NUTS.

HEAVY CROP IN 1922.

(Reprinted from "Raw Materials Review," January 1923, page 85).

We are indebted to Messrs. Landauer and Co. for the information in the following article.

THE Brazil nut crop on the Amazon in 1922 has been quite unprecedented, and has exceeded all expectations. It is in excess of the previous crop, which itself surpassed all previous records, by the notable quantity of almost 8,000 tons.

The total exports from Brazil during the year amounted to approximately 34,000 tons. Out of this 18,000 tons were shipped to America and about 15,000 tons to England, whereas with other heavy crops the maximum quantity imported into England in any one year has never before exceeded 9,000 tons.

Prices have been very much below the level of recent years, and this has encouraged the public to show increased interest, with the result that Brazils to-day are one of the cheapest classes of nuts on the market. It is now obvious that if the nuts can be supplied at such prices as those ruling this year, this country can apparently consume almost fabulous quantities. This is due in part to the growing demand for Brazil nuts in the confectionery trade, on lines similar to that in America, where the nut is one of the principal ingredients in candy manufacture. It must also be remembered that the Brazil is looked upon as the King of Nuts, and should by rights command a premium over any other description.

It may interest our readers to learn how these nuts are handled prior to their arrival in this country.

The nuts are the fruit of the Bertholletta Excelsa, a huge tree which grows wild in the Amazonian forest, and reaches a height of about 100 feet. About fifteen to twenty-five of the angular nuts are contained in each of the thick-shelled pods. To break open these pods and remove the nuts would appear to the average person a most difficult task, but the natives, who collect them after they have fallen from the trees, open them comparatively easily with a few blows of a woodman's hatchet, such as is used on the Amazon for cutting one's way through the thick undergrowth in the jungle.

When the nuts have been thus extracted from the pods the usual method is to place, say, 20 lbs. of the nuts in a basket and dip them repeatedly into the river, when the bad nuts will float to the surface. This practice is termed the washing of nuts, hence the term "large washed nuts," generally applied to practically all the nuts from the source. The term "large washed" by no means indicates that such

parcels do not contain a percentage of medium-size or even small-size nuts, as it would be very unlikely that the pods from any one tree would contain only large-size nuts.

It might be thought that the inferior sizes should be picked out and sold separately, but this would be most difficult. Indeed, it would be almost impracticable for the up-river trader to select and grade the nuts as to size before shipping them down to Manaos and Para ; the labour would be costly, he would obtain a lower price for the inferior sizes, probably without commanding any higher price for the larger nuts ; and thirdly, there might be difficulties in trying to keep the different grades apart on the river steamers.

Although nuts similar to those of the State of Amazonas are found on certain tributaries of the river Amazon in the State of Para, the bulk are inferior in size to those of Amazonas. The same applies to nuts from the other adjoining States and countries, such as the State of Natto Grosso, Federal Acre District, or Bolivia.

In consequence of pressing recommendations by Manaos dealers, this washing process, now in almost universal use throughout the State of Amazonas, is also being largely adopted in the gathering of Brazil nuts in the State of Para, with the result that nuts should arrive in the latter centre in better condition than has been frequently the case in the past.

When sufficient nuts have been accumulated at stations in the interior, perhaps several hundred miles from the exporting centres of Manaos, Itacoatiara, or Para, small river steamers are despatched up the various rivers, to bring down the nuts which clients have ready piled up in shacks on the river bank, or, in the case of larger nut-producing centres, as much as can be loaded in the holds or in the barges towed alongside.

Although new crop nuts frequently begin to arrive at Manaos during December, the principal crop months on the Amazon are from February onwards, and the heaviest are generally in March or April. During these months the steamers are turned round at Manaos and Para as quickly as possible and sent up river again. In spite of this they can only make a limited number of voyages into the interior, owing to the vast extent of the two States, Amazonas having an area of 732,000 square miles, or six times the size of Great Britain and Ireland, and Para, covering 444,000 square miles, or three and a-half times the same area.

With small crops the yields are all brought down and marketed by May or June, but during the last two years, when the nut harvest has been particularly abundant, large quantities have been received at Para and Manaos as late as September and even October, while smaller quantities continued to be brought down from the interior right up to the end of the year.

Of the 1922 yields approximately 15,000 tons were handled at Para, while over 18,000 tons were handled by Manaos exporters, and shipped from Manaos or Itacoatiara ; of the latter fully 15,000 tons were so-called large washed nuts.

From certain districts, which are inaccessible by steamboats, the nuts are brought by pack-mule at very considerable expense, with the result that when prices do not justify the expenditure, crops are abandoned altogether.

When the nuts reach the buyers in Manaos or Para, the greatest care is taken to prevent deterioration. The parcels are shovelled over riddles to remove any earth or nut-dust, and any damaged or mouldy nuts are picked out carefully.

Experience has taught shippers that nuts are best imported in bulk, and steamers built for the Booth Lines, which have practically the monopoly of the trade, are splendidly adapted for this purpose. The nuts, when loaded, are tightly partitioned off, according to grade and ownership, in order to avoid confusion on arrival. The company provides good ventilation, and turns them over and over during the voyage to avoid sweat, which causes the nuts to deteriorate and become mouldy. Mould is much to be feared; it spreads rapidly in an inexplicable manner, affects the kernels, and detracts from their value. Brazils are hardly ever shipped in bags, partly because the loss in weight—always a considerable item—is thereby increased.

On their arrival in the United Kingdom, splendid quay accommodation for landing and handling is placed at the disposal of the consignees by the Booth Line at Liverpool. It is an interesting sight to see the immense shiploads of 1,500-2,000 tons that were dealt with in April and May of this year. The nuts are raised out of the hold in baskets by cranes, and swung into well-ventilated sheds, where they are dumped in piles. All defective nuts are picked out, and, if the goods have been sold, they are bagged up in sacks of 1 cwt. to 2 cwt. in weight, and despatched. Those unsold are again bulked in well-ventilated warehouses. There they are continually turned and picked over, to keep them in good condition until required for consumption, which may be months later.

The large yields of the past few years are largely due to the depressed state of the rubber market on the Amazon, formerly a source of wealth to that enormous but sparsely populated region. Many of the rubber plantation employees have now emigrated, but many others have taken to the nut-gathering industry as a more profitable means of livelihood.

Although it is rather early to make a forecast of next year's crop, the information so far available from the Amazon indicates another heavy yield for 1923.

SECOND WORLD'S POULTRY CONGRESS AND EXHIBITION.

THE Second World's Poultry Congress and Exhibition will be held in the City of Barcelona on May 10th 1924 and continue until May 17, the former concluding in Madrid. The Executive Committee request us to give publicity to the above fact and to invite offers as soon as possible of papers and communications to be read at and submitted to the Congress. These should represent educational, investigational and official work, and projects for extensions. A leading object is to bring into one focus the knowledge already available in all countries.

With respect to the Exhibition, this will be demonstrative not competitive. In the live poultry each country is invited to send specimens of the breeds indigenous to it, and these which have proved most profitable, whether for food production, exhibition or ornamental. In this manner a complete exhibition will be made of all known breeds of poultry.

In the general sections of the Exhibition, displays are invited indicative of instructional, investigational and research work, of appliances in poultry husbandry and of accessory materials and products, as well as of books and publications. Manufacturers of appliances, etc. will be able to shew their goods under favourable conditions. A supply of the programme and regulations are expected shortly when the Department of Agriculture will be pleased to forward copies to those interested in this event.

Arrangements for the triennial Poultry Congresses is in the hands of the International Association of Poultry Instructors and Investigators. The Department of Agriculture Federated Malay States and Straits Settlements is a Patron of this Association, and would be pleased to assist as far as is in its power any gentlemen wishing to attend the Congress and Exhibition as official delegates, or representatives of public bodies and institutions engaged in instruction, experimental work and research, Poultry and Agricultural Societies, trade organizations, or of poultry breeders.

28th February 1923

NOTICES.

Groundnuts.

The Department of Agriculture, S.S. and F.M.S. has obtained addresses of local buyers of groundnuts both shelled and unshelled.

Growers of this legume who wish to dispose of their crop should communicate with the Agriculturist, Department of Agriculture, Kuala Lumpur.

If a sample is forwarded to this Department a price will be quoted.

Roselle Seed.

(HIBISCUS SABDARIFFA VAR: ALTISSIMA).

The Department of Agriculture, S.S. and F.M.S. has reduced the price of Roselle seed from $3/- to $2/- per lb.

10th March, 1923.

ERRATA.

Vol. X Nos. 10—12.

Kapok Oil page 285 *for* Nitrogen 3.08 per cent *read* Nitrogen 3.98 per cent.

Previous Sample Kuala Kangsar *for* Density '918 *read* density '919.

Cashew Nut Oil, page 301 *for* Oil 33.5 per cent *read* oil 43.5 per cent.